

REMARKS/ARGUMENTS

Status of Claims

Claims 1, 2, 4, and 6-25 are pending in the application.

Claims 26-35 are new.

The Applicants hereby request further examination and reconsideration of the presently claimed application.

Claim Rejections – 35 USC § 103

Claims 1, 2, 4, 8-10, and 13-25 stand rejected under 35 USC § 103(a) as being unpatentable over U.S. Patent 5,300,126 (*Brown*) in view of U.S. Patent 3,043,891 (*Stuckey*), U.S. Patent 3,773,844 (*Perry*)¹, U.S. Patent 5,062,866 (*Ho*), or U.S. Patent 5,220,091 (*Brinkmeyer*). Claims 1, 6, 7, 11, and 12 stand rejected under 35 USC § 103(a) as being unpatentable over *Brown* in view of U.S. Patent 6,132,600 (*Marchesseault*). Claims 2, 4, 6-17, 24, and 25 depend on claim 1, and claims 19-21 depend on claim 18. Thus, 1, 2, 4, and 6-25 stand or fall on the application of *Brown* and *Stuckey*, *Perry*, *Ho*, *Brinkmeyer*, or *Marchesseault* to independent claims 1, 18, 22, and 23. As noted by the United States Supreme Court in *Graham v. John Deere Co. of Kansas City*, an obviousness determination begins with a finding that **“the prior art as a whole in one form or another contains all” of the elements of the claimed invention**. See *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 22 (U.S. 1966). The Applicants respectfully submit that *Brown* and *Stuckey*, *Perry*, *Ho*, *Brinkmeyer*, or *Marchesseault* fail to contain all of the elements of the claimed invention, and therefore do not make obvious the pending claims.

¹ The Examiner refers to U.S. Patent 3,773,844 as *Louis et al.* However, the first-named inventor of U.S. Patent 3,773,844 is Eli Perry of St. Louis, Missouri.

Regarding claim 22, *Brown* and *Stuckey, Perry, Ho, Brinkmeyer*, or *Marchesseault* do not contain the limitation that the composition is bubbled through a liquid comprising the Diels-Alder dienophile. Claim 22 reads:

22. A method for removing conjugated olefins from a composition comprising: bubbling the composition through a liquid comprising Diels-Alder dienophile to form a liquid comprising Diels-Alder adduct; and arresting the Diels-Alder adduct, wherein the bubbling and the arresting occur in a substantially common zone.

As shown above, claim 22 recites that bubbling the composition through a liquid comprising the Diels-Alder dienophile forms a liquid comprising the Diels-Alder adduct. As is well known, bubbling involves two phases wherein a gas phase is passed through a liquid phase. The Examiner contends that the *Brown*'s disclosed temperature range of 0-200°C is sufficient to disclose the two-phase bubbling process because light olefins can be in either the gas or liquid phase within the disclosed temperature range. However, a thorough analysis of *Brown* reveals that *Brown* does not disclose or even contemplate a multi-phase bubbling reaction. Specifically, *Brown* teaches that his process occurs in an autoclave. An autoclave is well known to be a sealed single-phase reactor. In fact, *Brown* expressly admits that his autoclave is sealed. See *Brown*, col. 8, lines 20-47. Gas cannot be bubbled through a liquid in an autoclave because the gas has no place to go. Consequently, *Brown* does not disclose a multi-phase bubbling reaction.

In addition, *Brown* fails to disclose “the bubbling and the arresting occur in a substantially common zone.” Specifically, *Brown* teaches that his conjugated olefins are contacted with the dienophile, after which the resulting mixture is subjected to an etherification process. While *Brown* teaches the removal of the diene (via formation of a Diels-Alder adduct), *Brown* does not teach the removal of the Diels-Alder adduct prior to the etherification process. In fact, *Brown* teaches that the Diels-Alder adduct is *not* removed prior to the etherification process:

One of the significant features of the process of the invention is the fact that the treated feedstock containing the diene/dienophile adduct can be subjected to etherification of isoolefins in the feedstock without separation of the adduct. The adduct is carried through the etherification step into the reaction effluent. *Brown*, col. 9, lines 1-8.

Consequently, *Brown's* Diels-Alder adduct formation-etherification process occurs in at least two different vessels, and the bubbling and the arresting of the Diels-Alder Adduct does not occur in a common zone as recited in claim 22. Furthermore, *Stuckey, Perry, Ho, Brinkmeyer*, and *Marchesseault* do nothing to alleviate these two deficiencies in *Brown*. Consequently, *Brown* and *Stuckey, Perry, Ho, Brinkmeyer*, or *Marchesseault* do not contain a limitation in claim 22, and claim 22 should be allowed over the cited art.

Regarding independent claims 1, 18, 22, and 23, *Brown* cannot be combined with *Stuckey, Perry, Ho, Brinkmeyer*, or *Marchesseault* because *Brown* teaches away from the separation of the adduct from the monoolefins. MPEP § 2141.02.VI states: "A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984)." Claims 1, 18, 22, and 23 read:

1. A method for removing conjugated olefins from a composition comprising:
contacting the composition with a Diels-Alder dienophile to convert conjugated olefins to a Diels-Alder adduct; and
arresting the Diels-Alder adduct via a selectively permeable barrier or a phase differential.
18. A method comprising:
confining a Diels-Alder dienophile to a first side of a selectively permeable barrier wherein the barrier is more permeable to conjugated olefins and less permeable to Diels-Alder dienophile and Diels-Alder adduct;
and
contacting a composition comprising mono-olefins and conjugated olefins with the Diels-Alder dienophile to form Diels-Alder adduct;
wherein the contacting reduces the concentration of conjugated olefins in the composition.
22. A method for removing conjugated olefins from a composition comprising:

bubbling the composition through a liquid comprising Diels-Alder dienophile to form a liquid comprising Diels-Alder adduct; and **arresting the Diels-Alder adduct**, wherein the bubbling and the arresting occur in a substantially common zone.

23. A method for **removing conjugated olefins from a non-solid composition** comprising contacting the composition with a solid comprising Diels-Alder dienophile to form a solid comprising Diels-Alder adduct.

As shown above, all of the pending claims recite some form of separation of the adduct from the remaining composition. In contrast, *Brown* states that a significant feature of his invention is the fact that the adduct is **not** immediately separated from the monoolefins:

One of the significant features of the process of the invention is the fact that the treated feedstock containing the diene/dienophile adduct can be subjected to etherification of isoolefins in the feedstock **without separation of the adduct. The adduct is carried through the etherification step into the reaction effluent. Separation of the effluent by means well known in the art such as distillation produces a gasoline boiling range product stream that contains both alkyl tertiary alkyl ethers and adduct** which, in the case of MA, is tetrahydrophthalic anhydride or alkyl substituted derivatives thereof. The final gasoline boiling range product can also contain reaction products of the anhydride adduct or MA with alkanol that occurs during the etherification step or the product may contain unconverted MA. *Brown*, col. 9, lines 3-13.

As shown by the above statement, *Brown* teaches that it is generally considered advantageous to retain the adducts with the monoolefins after the conjugated olefins are removed from the feedstock. In fact, as explained below, the adduct may remain with the monoolefins to the final product as doing so results in gasoline that is enriched with oxygen and has a higher octane value. Thus, *Brown's* teaching of the retention of the adduct with the monoolefins teaches away from their separation. Because *Brown* teaches away from the separation of the adduct from the monoolefins, *Brown* cannot be combined with *Stuckey*, *Perry*, *Ho*, *Brinkmeyer*, or *Marchesseault*, and the pending claims should be allowed over the cited prior art.

Moreover, *Brown* cannot be combined with *Stuckey*, *Perry*, *Ho*, *Brinkmeyer*, or *Marchesseault* because it is contrary to the accepted wisdom in the art to do so. As stated in MPEP § 2145.X.D.3: **"The totality of the prior art must be considered, and proceeding contrary to accepted wisdom in the art is evidence of nonobviousness."** *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986)." In relation to the cited art, the accepted wisdom was to retain Diels-Alder adducts with the monoolefins. Evidence of this accepted wisdom is found in *Brown* at col. 3, lines 29-37:

Where the olefin conversion process comprises etherification of isoolefins with alkanol in a C₄+ or C₅+ olefinic hydrocarbon feedstream to produce a gasoline boiling range product enriched in oxygen and rich in high octane value alkyl tertiary alkyl ethers, **it has been discovered that the adduct, particularly those adducts formed with MA, is in the gasoline range and contributes usefully to the oxygen enrichment of the gasoline and to octane value.**

and at col. 9, lines 23-35:

It is a matter of considerable surprise and novelty in the present invention that the tetrahydrophthalic anhydride adducts prepared as described above in a gasoline boiling range hydrocarbon mixture result in a unique composition that displays both high octane value as well as supplementing the oxygen content of the gasoline. Considering the relatively high molecular weight of these adducts, the fact that they fall within the useful range of gasoline components, albeit at the high end, is unexpected; however, even more unexpected is the fact that they produce blending research octane numbers (RON) and motor octane numbers (MON) in the eighties.

As shown by the above statements, *Brown* teaches that it is generally considered advantageous to retain the adducts with the monoolefins. By doing so, the resulting gasoline is enriched with oxygen and has a higher octane value. Separating the adduct(s) from the monoolefins and/or the use of particular separating means for separating the adduct(s) from the monoolefins was proposed by the Applicants, not the cited art. Thus, the Examiner's conclusion of obviousness is not based on the teaching of the art, but rather is based on improper hindsight reasoning. As such, it is

contrary to the accepted wisdom in the art to combine *Brown* with *Stuckey, Perry, Ho, Brinkmeyer*, or *Marchesseault*, and consequently the pending claims should be allowed over the cited prior art.

New Claims

New claims 26-35 have been added and are neither anticipated nor rendered obvious by the cited art of record for the reasons given above. Specifically, the cited art of record fails to anticipate or render obvious the disclosed method “wherein composition further comprises mono-olefins” as recited in claims 26 and 27. Similarly, the cited art of record fails to contain all of the limitations of the method “wherein the Diels-Alder dienophile is maleic anhydride, derivatives of maleic anhydride, benzoquinone, derivatives of benzoquinone, dialkyl fumarates, dialkyl maleates, dialkylacetylenedicarboxylates, or combinations thereof” as recited in claims 28-35. Support for these new claims is found in paragraphs 33-44 of the specification.

In regards to new claims 28-35, the Examiner admits that *Brown* does not disclose separating the Diels-Alder adduct from the product mixture. See Final Office Action, p. 3. The Examiner attempts to make up for such a shortcoming with the statement “*Stuckey, Perry, Ho, and Brinkmeyer* teach a separation process for separating mono-olefins from a hydrocarbon mixture by using a membrane.” Final Office Action, p. 3. **Hydrocarbons are compounds that consist only of carbon and hydrogen.** See IUPAC Compendium of Chemical Terminology, 2nd Ed., 1997. In contrast, new claims 28-35 are directed to specific non-hydrocarbon Diels-Alder dienophiles. Specifically, the maleic anhydride, benzoquinone, dialkyl fumarates, dialkyl maleates, and dialkylacetylenedicarboxylates all contain at least one oxygen atom. The adducts recited in new claims 28-35 will also contain oxygen because, by definition, the adducts contain all of the dienophiles’ atoms. Thus, **the Diels-Alder adducts produced using the Diels-Alder dienophiles recited in new claims 28-35 are not hydrocarbons.** As such, while *Stuckey, Perry, Ho, or Brinkmeyer* may

separate hydrocarbon mixtures using a membrane (and without conceding such), *Stuckey, Perry, Ho, or Brinkmeyer* do not disclose separating mono-olefins from a non-hydrocarbon material. Consequently, *Stuckey, Perry, Ho, or Brinkmeyer* do not disclose the separation of the recited Diels-Alder adducts from the remaining composition. Consequently, *Brown and Stuckey, Perry, Ho, or Brinkmeyer* do not contain a limitation in the claims, and the pending claims should be allowed over *Brown, Stuckey, Perry, Ho, and Brinkmeyer*.

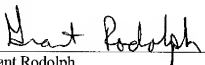
CONCLUSION

Consideration of the foregoing amendments and remarks, reconsideration of the application, and withdrawal of the rejections and objections is respectfully requested by Applicants. No new matter is introduced by way of the amendment. It is believed that each ground of rejection raised in the Office Action dated September 25, 2007 has been fully addressed. If any fee is due as a result of the filing of this paper, please appropriately charge such fee to Deposit Account Number 50-1515, Conley Rose, P.C. If a petition for extension of time is necessary in order for this paper to be deemed timely filed, please consider this a petition therefore.

If a telephone conference would facilitate the resolution of any issue or expedite the prosecution of the application, the Examiner is invited to telephone the undersigned at the telephone number given below.

Respectfully submitted,

Date: 12/21/07


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